

## WE CLAIM

1. A subscriber unit for connection with a public switched telephone network having at least one switch and at least one digital subscriber line in communication with the switch, the digital subscriber line capable of sending and receiving a plurality of data packets, the subscriber unit operable to send and receive voice calls over the public switched telephone network, the subscriber unit comprising:

a digital subscriber line interface unit, in communication with the digital subscriber line, for receiving the plurality of data packets from the digital subscriber line, for identifying selected ones of the plurality of received data packets corresponding to a received data stream of a first derived digital telephone line, and for transmitting, on the digital subscriber line, a plurality of transmitted data packets corresponding to a transmitted data stream of the first derived digital telephone line;

a coder/decoder, in communication with the digital subscriber line interface unit, for receiving the transmitted data stream, for coding the transmitted data stream into the plurality of transmitted data packets, for receiving the plurality of received data packets and for decoding the plurality of received data packets into the received data stream;

an analog-to-digital converter, in communication with the coder/decoder, for converting a transmitted analog signal into the transmitted data stream;

a digital-to-analog converter, in communication with the coder/decoder, for converting the received data stream into a received analog signal; and

an user interface unit, in communication with the analog-to-digital converter and the digital-to-analog converter, for providing an interface to a user of the subscriber unit, and for generating the transmitted analog signal and for generating an acoustic signal based on at least a portion of the received analog signal.

2. The subscriber unit of claim 1 wherein the user interface unit further comprises a telephone keypad and a DTMF tone generator.

3. The subscriber unit of claim 1 wherein the user interface unit further comprises a telephone handset and a switch hook.

5 4. The subscriber unit of claim 1 wherein the user interface unit further comprises a telephone line interface unit.

5. The subscriber unit of claim 1 wherein the user interface unit further comprises an alert signal generator.

10 6. The subscriber unit of claim 1 wherein the user interface unit further comprises a processor.

7. The subscriber unit of claim 6 wherein the user interface unit further comprises a display unit in communication with the processor.

8. The subscriber unit of claim 7 wherein the display unit is capable of displaying a plurality of data relating to an outgoing call.

15 9. The subscriber unit of claim 7 wherein the processor is capable of receiving and decoding caller identification data relating to the identity of an incoming caller and the display unit is capable of displaying a plurality of data relating an incoming call.

20 10. The subscriber unit of claim 9 wherein the user interface unit further comprises a call memory, in communication with the processor, for storing the plurality of data relating to an incoming call for a plurality of incoming calls.

25 11. The subscriber unit of claim 9 wherein the plurality of data relating the incoming call includes data indicating if the incoming call includes a facsimile message.

12. The subscriber unit of claim 7 wherein the display unit is capable of displaying a plurality of call control options.

13. The subscriber unit of claim 12 wherein the user interface unit further comprises a plurality of additional keys adjacent to the display unit, the plurality of keys operable by the user to activate selected ones of the call control options displayed adjacent thereto.

14. The subscriber unit of claim 8 wherein the user interface unit further comprises a call memory for storing the plurality of data relating to an outgoing call for a plurality of outgoing calls.

15. The subscriber unit of claim 14 wherein the plurality of data relating the outgoing call includes a duration of the call for at least one of the plurality of outgoing calls.

16. The subscriber unit of claim 15 wherein the plurality of data relating the outgoing call includes a destination telephone number of the call for at least one of the plurality of outgoing calls.

17. The subscriber unit of claim 16 wherein the user interface unit further comprises a data interface unit for downloading a plurality of stored data to an external device.

18. The subscriber unit of claim 6 wherein the user interface unit further comprises a smart card interface unit capable of accepting and communicating with a smart card.

19. The subscriber unit of claim 18 wherein the processor is capable of downloading a plurality of smart card data from a smart card inserted in the smart card interface unit, the plurality of smart card data including data associated with the user.

20. The subscriber unit of claim 7 wherein the processor is coupled to the coder/decoder and wherein digital subscriber line interface and

coder/decoder are capable of accepting data corresponding to a second derived digital telephone line and wherein the processor is capable of monitoring the status of the second derived digital telephone line.

21. The subscriber unit of claim 20 wherein the subscriber unit, in response to a signal generated by the user interface unit in response to an action of the user, is capable of initiating the second derived digital telephone line.

22. The subscriber unit of claim 21 wherein the subscriber unit, in response to a signal generated by the user interface unit in response to an action of the user, is capable of initiating up to N additional derived digital telephone lines, where N is greater than 2.

23. The subscriber unit of claim 7 wherein the processor is coupled to the coder/decoder, wherein the user interface unit further comprises a keyboard and wherein the subscriber unit is capable of communication with a first data service over the digital subscriber loop.

24. The subscriber unit of claim 23 wherein the communication with the first data service over the digital subscriber loop uses data packets that do not correspond to the first derived digital telephone line.

25. The subscriber unit of claim 23 wherein the user interface unit further comprises a display driver for driving a remote display device.

26. The subscriber unit of claim 1 wherein the digital subscriber line is an asymmetric digital subscriber line.

27. A telephone communication system comprising:  
an analog telephone line having analog voice signals carried by a subscriber loop; and  
a digital data line sharing said subscriber loop with said analog telephone line, said digital data line having a digital voice channel for placing telephone voice calls.

28. The invention of claim 27 wherein the analog telephone line and the digital data line simultaneously provide two or more voice channels over the subscriber loop.

29. The invention of claim 27 wherein the analog telephone line comprises a POTS line.

30. The invention of claim 27 wherein the digital data line comprises a high-capacity digital subscriber line.

31. The invention of claim 27 wherein the digital data line comprises an asymmetric digital subscriber line.

32. The invention of claim 27 wherein the digital data line comprises multiple data and voice channels.

33. The invention of claim 27 wherein the digital data line comprises an ATM transport protocol.

34. The invention of claim 27 further comprising an interworking unit which interfaces the digital voice channel from said digital data line into a circuit-switch protocol.

35. The invention of claim 34 wherein said digital voice channel is carried by an ATM transport protocol.

36. The invention of claim 34 wherein the circuit-switch protocol comprises a TR-303 interface.

37. A telephone communication system comprising:  
means for providing a telephone line having analog voice signals carried by a subscriber loop; and  
means for providing a digital data line sharing said subscriber loop with said subscriber loop with said telephone line, said digital line providing a digital voice channel for placing telephone voice calls.

38. The invention of claim 37 wherein said means for providing a telephone line comprises a central office switch.

39. The invention of claim 37 wherein said means for providing a digital data line include a digital carrier system.

5 40. The invention of claim 37 further comprising a means for separating analog voice signals from digital data signals.

41. The invention of claim 40 wherein said means of separating analog voice signals includes a splitter comprising a high-pass and a low-pass filter.

10 42. A method of providing a digital telephone line comprising:  
providing an analog telephone line with analog voice signals carried on a subscriber loop;  
providing a digital data line on said subscriber loop with said analog telephone line, said digital data line having a digital voice channel; and  
15 placing a telephone voice call over the digital voice channel of said digital data line.

43. The method of claim 42 further comprising the step of:  
interfacing said telephone voice call carried by a data protocol to the switch protocol.

20 44. The method of claim 43 wherein said step of interfacing comprises converting a telephone voice signal carried by the data protocol to a switch protocol.

45. The method of claim 44 wherein said step of interfacing comprises the steps of:

25 converting said telephone voice call carried by the data protocol to an analog voice signal; and  
converting said analog voice signal to a switch protocol.

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46. A subscriber location for use in a telecommunication system, the subscriber location comprising:

a subscriber loop carrying an analog telephone voice line and a digital data line, wherein the digital data line comprises an asymmetric digital subscriber line having a digital telephone voice line;

a digital telephone in communication with the subscriber loop; and

a POTS telephone in communication with the subscriber loop, wherein the subscriber location provides for separate telephone voice calls on the digital telephone and the POTS telephone over the subscriber loop.

47. The invention of claim 46 wherein the subscriber loop comprises a copper twisted pair.

48. The invention of claim 46 wherein the subscriber location further comprises:

the POTS telephone in communication with the subscriber loop via the analog telephone line;

the digital telephone in communication with the subscriber loop via the digital data line; and

wherein the analog telephone line and digital data line communicate with the subscriber loop via a network interface device.

49. A method of placing a telephone voice call over a public switched telephone network (PSTN) comprising the steps of :

providing a subscriber loop in communication with the PSTN, the subscriber loop having an analog telephone voice line and a digital data line, wherein the digital data line comprises a digital telephone voice line; and

placing a telephone voice call from a digital telephone in communication with the digital telephone voice line; and

sending the telephone voice call on the subscriber loop to the PSTN.

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50. The method of claim 49, wherein the step of sending a telephone voice call from a digital telephone comprises converting an analog voice signal into a packetized digital data stream and sending the packetized digital data stream over a subscriber data network to the digital telephone voice line.

51. The method of claim 50, wherein the step of converting the analog voice signal comprises converting the analog voice signal into a packetized digital data stream having an asynchronous transfer mode (ATM) format.

52. The method of claim 50, wherein the step of sending the telephone voice call on the subscriber loop to the PSTN further comprises removing the packetized digital data stream from the subscriber loop and transmitting the packetized digital data stream to a switch in communication with the PSTN via a data network.

53. The method of claim 52, wherein the step of transmitting the packetized digital data stream to a switch further comprises transmitting the packetized digital data stream to a data access tandem switch, and converting a protocol of the packetized digital data stream to a protocol of the switch in communication with the PSTN, whereby the telephone voice call placed on the digital telephone is transmitted over the PSTN.

54. A telephone communication system comprising:  
at least one digital telephone in communication with a digital telephone voice line on a digital data line; and

at least one POTS telephone in communication with an analog telephone line;

a network interface device connected to a subscriber loop, wherein the network interface device comprises a signal splitter configured to combine telephone voice signals received from the analog telephone line and digital data line onto the subscriber loop and separate telephone voice signals



received from the subscriber loop onto an appropriate one of the analog telephone line and digital data line;

the subscriber loop carrying the digital data line and the analog telephone line on a common communication medium; and

5 a central office switch configured to communicate with the subscriber loop, the central office switch having a splitter for separating signals on the subscriber loop into analog telephone line telephone voice signals and digital data line signals, wherein the digital data line signals comprise digital telephone voice line voice signals.

10 55. The invention of claim 54, wherein the central office switch further comprises a local telephone switching device in communication with the switching device, the local telephone switching device configured to receive the analog telephone line voice signals for transmission over a public switched telephone network (PSTN).

15 56. The invention of claim 55, wherein the central office switch further comprises a digital subscriber line access multiplexer in communication with the splitter for multiplexing the digital data line signals into a format for transport over a data network.

20 57. The invention of claim 56, further comprising a tandem location in communication with the data network, the tandem location having an interworking unit comprising a protocol switch configured to convert digital telephone line voice signals from the format for transport over the data network into a format for transport over the PSTN.

25 58. The invention of claim 57, wherein the format for transport over the PSTN comprises TR-303.

59. The invention of claim 54, wherein the common communication medium comprises a copper twisted pair.

60. The invention of claim 59, wherein the digital data line is an asymmetric digital subscriber line (ADSL) having an asynchronous transfer mode (ATM) transmission protocol.

61. The invention of claim 54, wherein the signal splitter of the network interface device comprises a low pass filter connected to the analog telephone line and a high pass filter connected to the digital data line, whereby the high pass filter is configured to pass an asymmetric digital subscriber line digital signal carrying a telephone voice call to the digital telephone and the low pass filter is configured to pass a POTS telephone call to the POTS telephone.

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